Spring and Fall Freezing Temperatures in New York State

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SPRING and FALL FREEZING TEMPERATURES in NEW YORK STATE

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Freezing temperatures during the late spring and early fall have great influence on the economy of New York State. Much of the industry of the state is affected by sub-freezing temperatures but their effect on agriculture is of greater importance. In many instances the length of the growing season (the number of days between spring and fall freezes) determines the economic feasibility of growing certain crops. This bulletin was compiled to inform the New York State agriculturist and industrialist of the risk involved from late spring and early fall freezes of varied severity.

The data in this pamphlet will assist the farmer, orchardist or home gardener in selecting the most favorable site for his operation and will inform him of the risks involved in early and late planting dates. These data also should be of considerable value to industry in planning their respective operations.

Definition of Frost versus Freeze

It is to be noted that frost is not used in the classification of the data included in this study. Frost is defined as the deposit of ice crystals on the surface of plants or other ground objects. It frequently does not occur with sub-freezing temperatures that injure plants, but it can occur when the reported temperature, taken at an eye level height of about five feet, is above the freezing level. As a rule, during clear calm nights temperatures at the ground level are lower than those at the observation level used by the weather bureau. The temperatures used in this study are made at the five-foot level; consequently, allowance should be made for somewhat lower temperatures at the ground level and somewhat higher temperatures at the blossom level of fruit trees.

Plant Injury

There is no evidence that frost is harmful to plants, but rather, that most injury to plants is the result of the low temperature within the plant cells in the presence or absence of frost. Either the cell walls of the plant are broken because the fluids within the plant freeze and expand, or the delicate nature of the cell constituents is disrupted beyond repair, or both can occur.

A great number of factors influence the degree of injury that the plant will undergo as a result of low temperatures.

Species: Many woody plants and evergreens show no injury, but succulent plants such as squash and tomato are readily killed by low temperatures.

Variety: The date of flowering and maturity of different varieties influence susceptibility to freezing temperatures. For example, an apple variety that blooms late may escape injury while an early blooming variety may suffer heavy injury from temperatures below 27° to 29° F.

Part of the plant: Some plant parts will withstand low temperatures without injury, but blossoms, young shoots and fruit may be very sensitive.

Rate of cooling: Sudden freezing can be more harmful than gradual cooling.

Duration of cooling: Injury to the plant increases as the length of exposure to cool temperatures increases. Some sensitive plants such as tomatoes, cucumbers and corn can be injured by several days of continuous cool but above-freezing temperatures.

Hardening: Several short periods of cool temperature can cause a "hardening" or an increase in the resistance of the plant to actual freezing temperatures.

Dry matter content: Freezing temperatures will kill high moisture seeds but dry seeds can withstand very low temperatures.

In view of the complex nature of injury to plants from freezing temperatures, it is impossible to establish a critical temperature for a specific plant. Therefore, a more general description of the susceptibility

and kind of injury most often suffered because of freezing must serve as a guide.

Vegetable crops

The crops are classified according to the degree of injury suffered from freezing temperatures.

Tender, *plants killed*—beans (snap, pole, lima), tomatoes, corn (sweet, popcorn), squash (summer, winter), melons (musk, water), cucumbers, pumpkins, okra, pepper, egg plant; Semi-hardy, *some injury*—peas (blossom only), lettuce (heads but not seedlings), endive (heads but not seedlings), asparagus (shoots in spring only), Chinese cabbage, Swiss chard, fennel, dill, mustard, celery, potatoes (plant but not tuber); Hardy, *no injury*—beets, carrots, turnips, rutabagas, radishes, parsnips, mangels, spinach, collards, kale, brussels sprouts, broccoli, onions, parsley, salsify.

Fruit crops

Hardy fruit crops are not killed by freezing temperatures but below-freezing temperatures may cause considerable injury as listed below:

Crop	*Site of most severe injury*	*Range of temperatures at which injury will begin to occur*	
		spring	*fall*
apples	full bloom	27° to 29° F.	none
peaches	full bloom	25° to 27° F.	none
cherries, sweet and sour	full bloom	27° to 29° F.	none
plums	full bloom	26° to 28° F.	none
pears	full bloom	26° to 28° F.	none
strawberries	full bloom	26° to 30° F.	none
raspberries	young shoots	30° F.	none
grapes	young shoots, fruit and foliage	30° F.	29° to 30° F.

Field crops

Corn is the only important field crop in New York State which suffers significant injury because of freezing temperatures. No significant difference in susceptibility to freezing has been observed in different corn hybrids, but early maturing hybrids can be used in regions with short growing seasons. Young shoots of forage legumes can be injured by freezing temperatures in late spring, but the plants usually recover rapidly.

Ornamental plants

Ornamental herbaceous plants, woody plants and shrubs that are winter hardy in New York State suffer no significant injury from spring or fall frosts, with the exception of spring freezing injury to large flowered magnolia blossoms. Conversely, those perennial plants that are not winter hardy will be injured by low spring temperatures.

Annual flowers that normally sow themselves (*i.e.*, snapdragons, poppies) are less susceptible to freeze injury than those that must be resown (*i.e.*, zinnias). The so-called "hardy annuals" (*i.e., Galendula*) are less susceptible to freezing temperatures than non-hardy annuals.

Since many ornamental plants are brought into New York State from other regions, a general rule is that the greater the change of climatic conditions from the native habitat to those of New York State, the more susceptible the plant is to injury from adverse weather conditions.

Meteorological Conditions Favoring Freezing Temperatures

There are three meteorological conditions that are primary requisites for late spring or early fall freezes: 1) the presence of cool dry air; 2) clear skies; and 3) light or calm winds.

The invasion of cool air over New York State is indicated by a wind direction from west to north and in most instances a rising or already high barometer reading. The cool air is centered in a high pressure cell moving southeastward out of central Canada. When this area of high pressure has taken a course that allows the central portion of the high pressure area to pass across New York State, we have near optimum conditions for satisfying the other two necessary meteorological conditions.

Freezing temperatures are most likely to occur on clear nights. With high pressure and cold Canadian air over New York State, skies are frequently clear near sunset. These fair skies permit the invisible heat waves that are continuously leaving the earth's surface to pass through the atmosphere. This radiation continues through the night and the greatest heat loss has occurred by sunrise. Near sunrise, therefore, is the time of greatest danger, but in extreme cases the freezing temperatures may be reached several hours before and continue for hours after sunrise. Cloudiness, on the other hand, materially lessens the chances of frost or freezing temperatures. This is true even in the case of high cloudiness, but to a lesser extent. The clouds act somewhat as the blankets used for bed covering and they reflect the invisible heat waves back toward the earth's surface.

The third requirement for most freezing temperatures is light or calm winds. On clear nights, as the

earth's surface loses heat, the layers of air nearest the ground become coolest. Since cool air is heavier than warm air, the cool air clings to the surface. The wind mixes the cooler air near the ground with the warmer air a short distance off the ground. Even light to moderate winds provide some protection from freezing. If the freezing potential of the air is not very great, calm winds will be necessary, but if the air is cold enough to provide a moderate freezing potential, even light winds may not be enough to mix a sufficiently deep layer of air to prevent freezing. It should be remembered that the wind speed is usually less at night and that afternoon breezes may die down during the night. It is necessary to observe the wind well into the evening before concluding that wind will prevent the occurrence of freezing temperatures.

Elevation and Slope of Terrain

As most agriculturists know, temperatures vary considerably over the average farm, and widely over a county area. On clear calm nights temperatures are lower in valleys than on the slopes. Because cool air is more dense (heavier) than warm air, it flows to the lowest spots much as water seeks the lowest levels. During the course of a night in the late spring and early fall, cold air can build up to a depth of several hundred feet as a result of air drainage into a valley. Under optimum conditions, temperatures may be 8 to 15 degrees or more lower on the floor of a small valley than on the upper slopes. Undrained valleys represent the worst so-called "frost pockets." The northern slopes, also, will be colder than those exposed to the south since they receive less sunshine during the day and enter into evening shadow conditions earlier.

Land areas near a large body of water have greater immunity to frosts than do inland locations. Under similar conditions, land warms and cools about five times as rapidly as water. During the winter months the temperature of the water is lowered to such a point that seas and large lakes remain comparatively cool throughout the spring and exert a two-fold influence on the air temperature for a distance inland: 1) the cold air from the water tends to retard vegetation until the period of spring frosts has passed; 2) during the period of spring frosts, it tends to hold the temperature of the air over adjacent lands, particularly at night, above the danger point.

Prevention of Injury to Plants[1]

Farmers and gardeners can use various procedures to protect crops from freezing. All should be considered and utilized insofar as is practical.

Site selection

Proper site selection is the most effective means of preventing freezing injury. As mentioned above, cold air collects in low areas or in pockets. Slopes provide good air drainage but heavy hedge rows across slopes may trap cool air flowing down slopes and create frost pockets. Southerly slopes absorb more heat from the sun and release more heat at night than do northerly slopes. Large bodies of water have a moderating influence on the surrounding areas and thus decrease the freeze hazard. Muck soils tend to be more "frosty" than other soils because of the insulating effect of the organic matter, especially when the surface is dry. Early crops should be located in the more favorable areas on a farm.

Tempering the plants

Slightly toughened plants with fairly high dry matter content withstand lower temperatures without freezing better than do soft, succulent plants low in dry matter. Field exposure to sunlight and to fairly low humidity will harden plants. Whenever possible, plants should be hardened gradually prior to transplanting them in the field. Avoid transplanting tender plants into the field on days before cool temperatures are predicted.

Trapping heat

Losses of heat to the upper air through radiation can be reduced by covering the objects to be protected so that the heat radiated from them and the surrounding soil will be trapped or reflected back.

Paper and brush protectors such as those used in the desert valleys of the Southwest are very effective though quite expensive. Modified versions might be used under New York conditions.

Glasine hot-caps and hot-tents are not as effective as the paper-brush protectors, but they do trap heat during sunny days and this helps add to the soil. Both paper-brush protectors that are placed to face south and hot-caps will provide warmer air temperatures for crops during cool but sunny days.

Makeshift protectors such as bushel baskets, cartons, boxes, burlap sacks or straw can be put over plants to provide protection on small acreages. These should be put on late in the day and removed the next morning.

Good plant foliage can serve as a protector for concealed fruits such as tomatoes or snap beans and for the root or tuber crops. Foliage often provides excel-

[1]Minges, P. A., "Frost prevention for Vegetables." Department of Vegetable Crops, Cornell University Mimeo VC–64, Jan. 1958.

lent protection against one or two light to moderate freezes.

Covering the glass sash with good insulating materials on cool nights will add considerable protection to plants in cold frames. Such covers must be removed during the day to permit reheating of the soil as well as to provide sunshine for the plants.

Covering the plants with soil has been used successfully on young potatoes when unseasonable frosts have threatened the crop. On muck soils, hilling soil around mature celery plants has been known to protect the crop from excessive damage from moderate freezes.

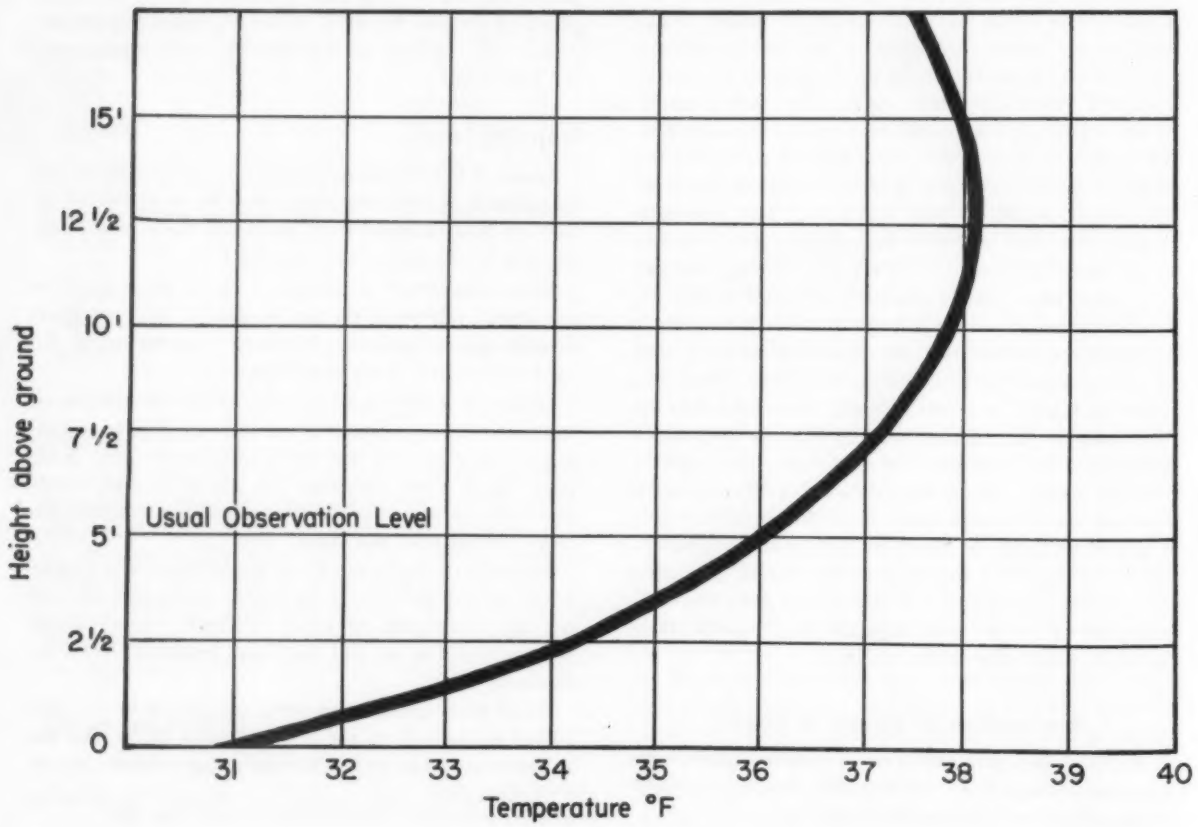
Agitation of the air

Wind machines take advantage of natural sources of heat by mixing the warmer air of an overhead inversion layer with the cooler air below. The turbulence created moves the warmer air over the plants thereby helping to keep the exposed portions above the freezing point. Wind machines that usually consist of airplane propellers attached to powerful gasoline or electric motors are most effective when there is a strong temperature inversion. One good machine often will protect three to four acres against a relatively light freeze. Operated wind machines when temperature inversions are weak or during prolonged freezing periods caused by cold air masses, however, may be valueless or even harmful.

Application of water

Sprinkling and surface irrigation can be used successfully to combat freezing, particularly in the spring. As the water cools and/or crystallizes into ice, heat is released which serves to warm the plant parts. Water has a very high specific heat and reasonably good latent heat of fusion. This means that a pound of water

Illustration of low level temperature distribution possible on clear, cold night with late spring or early fall freeze. Even more extreme cases have been observed.



releases a relatively large quantity of heat as it cools and freezes. Sprinkling is frequently more efficient than surface application because it places the water directly on the plants where the heat is needed. Sprinkler applications of one-tenth of an inch of water per hour, properly applied, has adequately protected tender vegetables and strawberry blossoms during ordinary late spring freezes. The sprinkling must be continuous during the period temperatures are below freezing and continued until all ice has melted after the morning warm-up is under way. With the portable sprinkler the amount of land that can be protected is limited to the area that can be covered by one setting for it would be impractical to try to move the equipment. The system can be stretched usually to cover double the area ordinarily irrigated in one setting. This method of freeze protection, of course, is the most feasible on farms where irrigation is practiced. It is highly questionable that a sprinkler system could be justified on the basis of freeze protection alone. Either "Skinner" or portable sprinklers are satisfactory.

Heating

Artificial heating offers possibilities for supplementing natural heat. Because of the high investment required for equipment and the cost of fuel for burning, however, regular heaters have not been used extensively for crop protection in New York. The temporary nature of the crops, the uncertainty of when a real killing freeze will occur and frequently unsettled marketing conditions are further deterrents. Heaters have been used successfully both to protect new plantings in the spring and crops at the harvest stage. Failures often can be traced either to starting the heaters too late or to using an insufficient number. It is essential that sufficient heat be supplied to balance the radiation losses. For this reason it is advisable that a grower who is considering using artificial heat consult local field heating experts, his county agent or the Agricultural Engineering Department at Cornell before buying expensive equipment.

Smoke and smudges

A blanket of smoke over an area supposedly reduces heat loss by radiation much like a cloud cover reduces heat loss. In actual practice, it is extremely difficult to maintain a heavy blanket of smoke over an area on a cold night because of low humidity and air drift. Thus, smudge fires are of little benefit.

Chemical smoke screens as used in military operations afford little or no protection against freeze damage and are more expensive than heating.

Preparation for freezes

Just as important as the method of freeze protection is the problem of being prepared when freezing occurs. It doesn't help to have a sprinkler system in the barn or heating pots empty of fuel on the cold nights. The greatest efficiency is obtained also by knowing the proper time to start operating wind machines, heaters or sprinklers and when to shut them off. The latter problem is best solved by having accurate thermometers in strategic locations in the field as well as near the house. On nights when frosts are imminent these thermometers must be checked periodically. As the temperatures in the field at the crop level approach the freezing point, heating operations can be started.

Explanation of Tables

1. Each station in the following tables is listed by name and county. In several instances the observation equipment has been located in more than one location within or near the listed community. Where the change in location is considered to have a major effect on the observed values, the data have been given separately.

2. Elevation listed is the height above sea level of the observation station. In cases where the station has had two or more locations in the community, the elevation listed is that of the latest location.

3. Length of record listed in the tables is the number of years considered in deriving the data for the next four columns; namely, the earliest and latest observed dates of 32° F. or lower temperatures in both spring and fall. The mean data in the last ten columns are statistically derived and the period used is in no case less than ten years or more than thirty. In some cases the period for observed and derived data is the same but these cases are decidedly a minority.

4. Earliest and latest dates of the last 32° F. or lower temperature in spring indicate the extremes of the beginning of the "growing season." For example, at Addison, New York, the earliest date on which the last 32° F. or lower temperature in the spring has been reported is April 9th. In that particular year, no day after April 9th reported a temperature as low as 32° F. April 9th therefore represents the earliest beginning of "growing season" at Addison. At the other extreme, on at least one occasion 32° F. or lower temperatures have been reported as late as June 10th at Addison.

5. Earliest and latest dates of the last 32° F. or lower temperature in fall indicate the extremes of the end of the "growing season." At Addison a 32° F. temperature has been reported as early as September 10th but there has been at least one year when no 32° F. or lower temperature was recorded until October 28th.

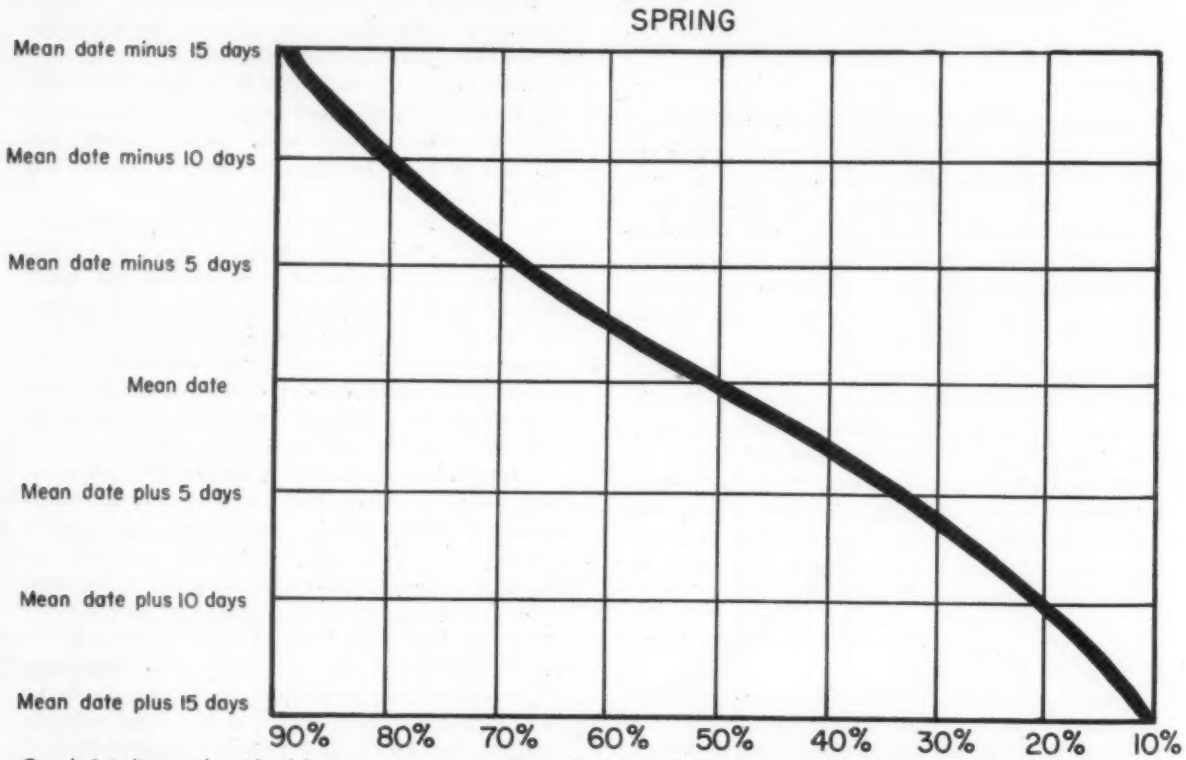
6. Mean dates of the last spring or first fall occurrence of listed temperatures are statistically derived data. This table is based on work done in 1952 by Mr. H. C. S. Thom in cooperation with the Department of Agricultural Economics of Cornell University. Data from a few additional stations along the eastern border of the state have been computed especially for this publication using the same formula and criteria employed by Mr. Thom. Half of the years will have the mean temperature before the mean date and half after it.

Adaptation of Tables for Values Other than the Mean

A recent study by H. C. S. Thom and R. H. Shaw[2] of data on freezing temperatures for Iowa and additional studies by Mr. Thom of data for New York have shown that the variance for the individual stations are not significantly different. This makes it possible to analyze the variances for a state as a whole and to derive a single variance and standard deviation to use for all stations within a state. This procedure, as worked out by Mr. Thom for the New York State data, is used in this bulletin. The weighted mean variance for station freeze date as computed for New York State is 136.7, which gives a standard deviation of 11.69. This information is important in converting the mean dates listed to other probabilities.

For the vast majority of operations there is a quick method for determining the degree of frost risk on any

[2]Thom, H. C. S. and Shaw, R. H. "Climatological analysis of freeze data for Iowa." *Monthly Weather Review;* Volume 86, Number 7, July 1958, p. 251.



Graph 1 indicates the risk of freezing temperatures from 15 days before to 15 days after the mean date for the last 32° F. or lower temperature in spring.

given date. While not strictly correct mathematically the following method is considered adequate for normal farm or industrial operations.

Included in this bulletin are two graphs—one for spring and one for fall. The bottom of the graphs shows percentages from 10 to 90. The horizontal lines of the graphs are labeled from "mean minus 15 days" to "mean plus 15 days." In order to use the graphs, find in the table the mean date for your community of the temperature critical to your operation. Enter this date as "mean" on the left margin of the graph and add and subtract days as indicated. At Addison, therefore, we find the mean date of the last 32° F. or lower temperature in spring is May 21st. "Mean minus 5" would be May 16th and "mean plus 5" would be May 26th and mean plus and minus 10 and 15 would be similarly noted and entered on the graph. Once these seven dates have been entered on the given graph, it is possible to tell the degree of risk for any date or on what date the degree of risk reaches any percentage. Therefore, if a farmer wishes to wait to plant his crop until the chance of having 32° F. temperature is statistically less than 30%, he can go vertically up the line labeled 30% until he reaches the curve and then horizontally to the left on the graph to figure out the date. After this date he should have 32° F. temperature in only three years out of ten; in seven out of ten years the last 32° F. temperature will have occurred before this date.

Graph 2 indicates the risk of freezing temperatures from 15 days before to 15 days after the mean date for the first 32° F. or lower temperature in fall.

Explanation of Maps

Map 1—Locations of stations used in this study and listed in the table.

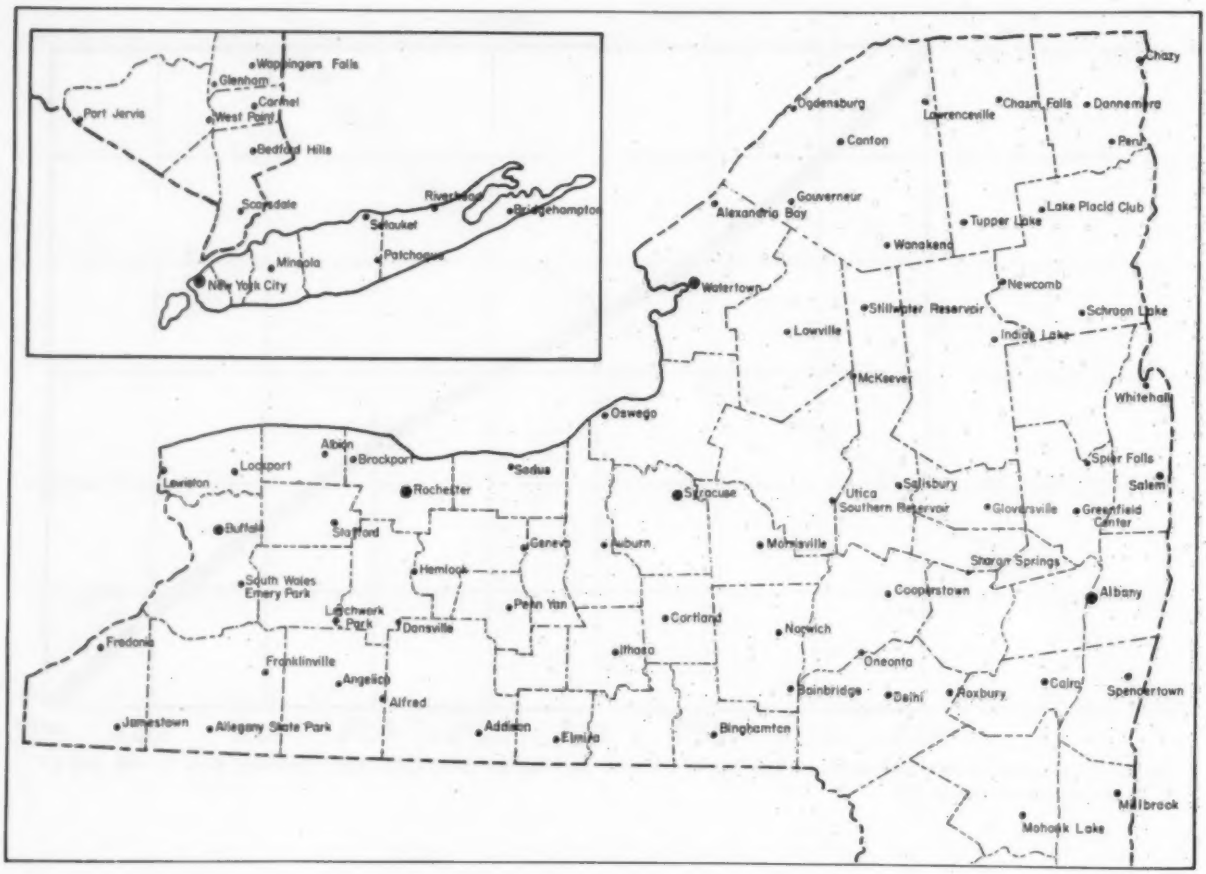
Map 2—Mean date of last 32° F. or lower temperature in spring.

Map 3—Mean date of first 32° F. or lower temperature in fall.

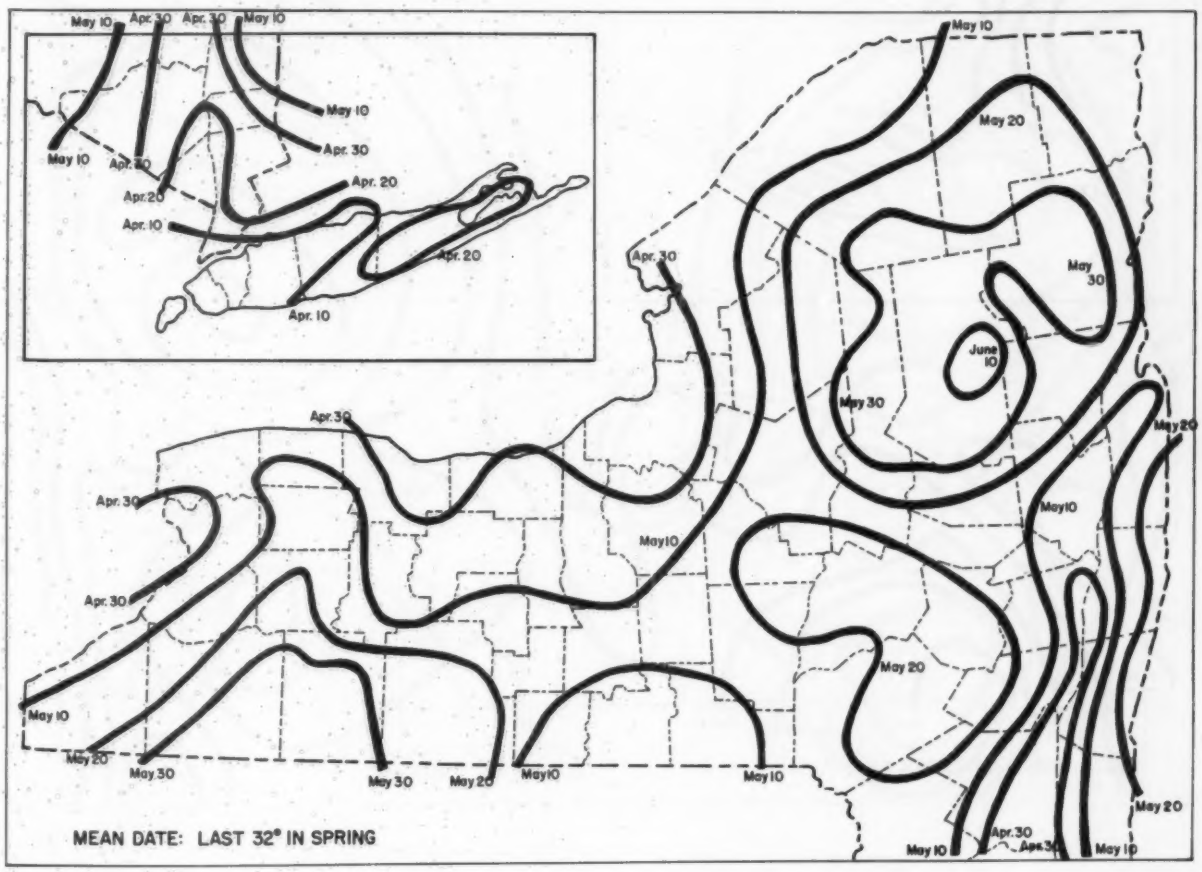
Map 4—Number of days between mean dates of last 32° F. or lower temperature in spring and first freezing temperature or lower in fall. This period is defined as the "growing season."

Maps similar to 2 and 3 can be drawn for any of the temperatures listed in the tables. Such maps have been drawn as part of this study, but the similarity of the pattern from map to map makes their publication unnecessary.

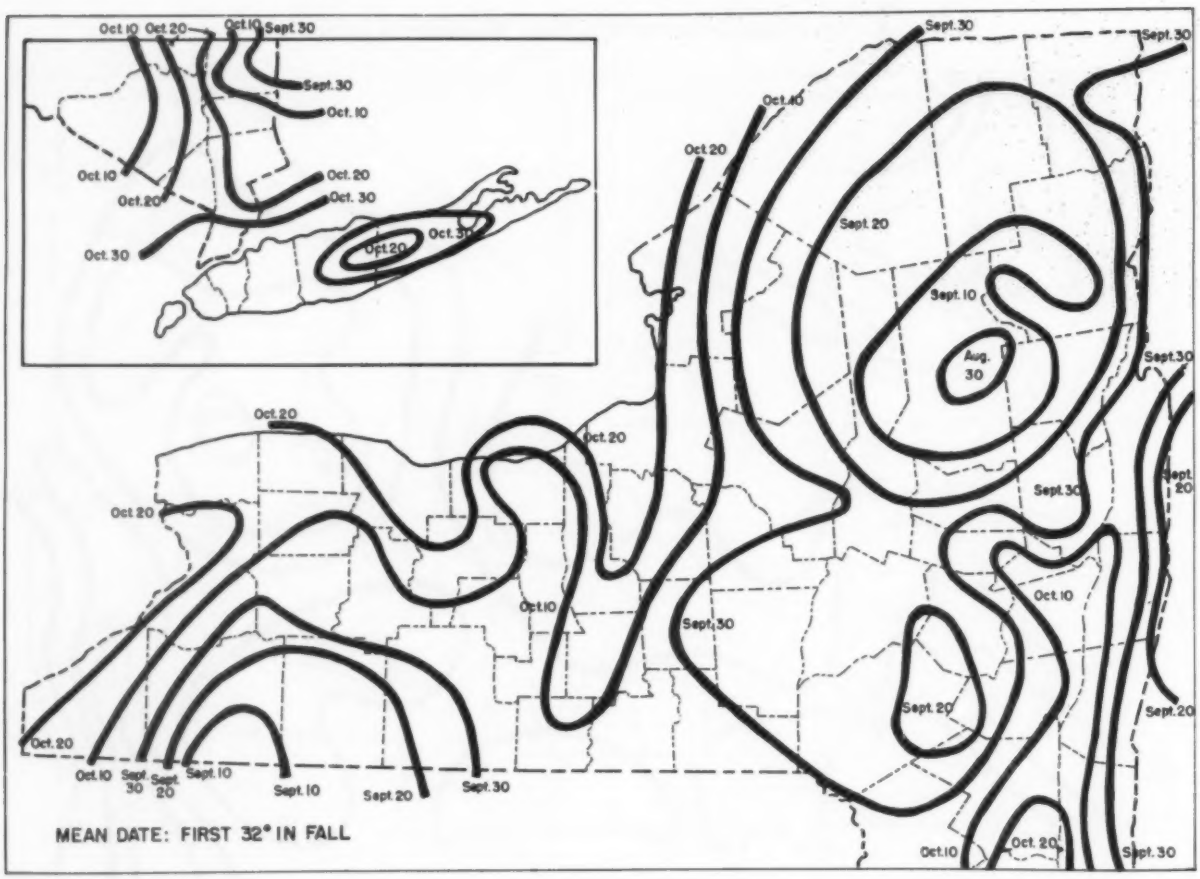
1 **Locations of stations used in this study and listed in the table.**



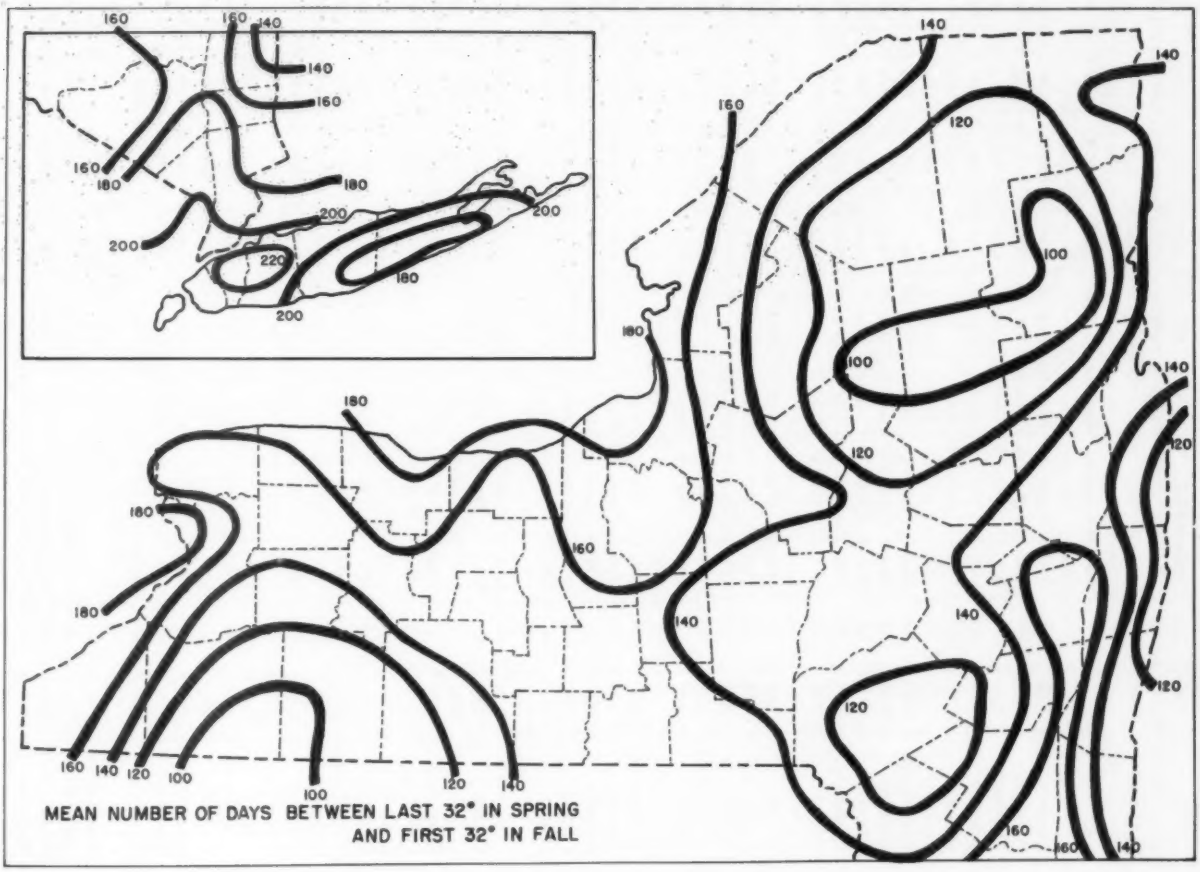
2 Mean date of last 32°F. or lower temperature in spring.



3 Mean date of first 32°F. or lower temperature in fall.



4 Number of days between mean dates of last 32°F. or lower temperature in spring and first freezing temperature or lower in fall. This period is defined as the "growing season."



Station	County	Elevation	Length Record	Last 32°F. Temperature in Spring		First 32°F. Temperature in Fall		Mean Date Last Spring Minimum					Mean Date First Fall Minimum				
				Earliest	Latest	Earliest	Latest	16°F.	20°F.	24°F.	28°F.	32°F.	32°F.	28°F.	24°F.	20°F.	16°F.
Addison	Steuben	990	63	Apr. 9	June 10	Sept. 10	Oct. 28	Mar. 25	Apr. 8	Apr. 22	May 6	May 21	Sept. 30	Oct. 10	Oct. 24	Nov. 5	Nov. 22
Albany	Albany	277	83	Mar. 30	May 30	Sept. 15	Nov. 14	Mar. 13	Mar. 19	Mar. 31	Apr. 14	Apr. 27	Oct. 13	Oct. 26	Nov. 9	Nov. 22	Nov. 29
Albion	Orleans	465	19	Apr. 13	May 24	Sept. 29	Nov. 5	Mar. 20	Mar. 25	Apr. 2	Apr. 22	May 1	Oct. 15	Nov. 3	Nov. 18	Nov. 28	Dec. 8
Alexandria Bay	Jefferson	283	20	Mar. 24	May 19	Sept. 26	Oct. 31	Mar. 22	Mar. 31	Apr. 8	Apr. 18	May 2	Oct. 10	Oct. 27	Nov. 11	Nov. 20	Nov. 28
Alfred	Allegany	1760	60	Apr. 18	June 22	Aug. 24	Oct. 27	Apr. 3	Apr. 15	Apr. 27	May 14	May 27	Sept. 19	Oct. 5	Oct. 14	Oct. 30	Nov. 15
Allegany State Park	Cattaraugus	1500	32	May 4	June 24	Aug. 5	Oct. 14	Apr. 7	Apr. 20	May 8	May 23	June 7	Sept. 9	Sept. 29	Oct. 15	Nov. 3	Nov. 16
Angelica	Allegany	1420	64	Apr. 9	June 22	Aug. 6	Oct. 28	Apr. 4	Apr. 20	May 2	May 18	June 1	Sept. 12	Sept. 29	Oct. 12	Oct. 26	Nov. 10
Auburn	Cayuga	715	64	Apr. 9	June 22	Sept. 15	Nov. 15	Mar. 16	Mar. 24	Apr. 5	Apr. 18	May 2	Oct. 21	Nov. 8	Nov. 19	Nov. 28	Dec. 2
Bainbridge	Chenango	1015	20	Apr. 30	June 1	Aug. 25	Oct. 22	Mar. 27	Apr. 3	Apr. 21	May 7	May 15	Sept. 26	Oct. 11	Oct. 23	Nov. 6	Nov. 23
Bedford Hills	Westchester	425	62	Mar. 22	May 30	Sept. 20	Nov. 11	Mar. 12	Mar. 19	Mar. 30	Apr. 15	Apr. 29	Oct. 13	Oct. 26	Nov. 8	Nov. 23	Dec. 4
Binghamton	Broome	852	67	Apr. 13	May 29	Sept. 14	Nov. 10	Mar. 14	Mar. 23	Apr. 4	Apr. 19	May 4	Oct. 6	Oct. 20	Nov. 7	Nov. 21	Dec. 2
Bridgehampton	Suffolk	60	21	Mar. 27	May 12	Sept. 23	Nov. 24	Mar. 6	Mar. 10	Mar. 19	Apr. 5	Apr. 20	Nov. 2	Nov. 17	Nov. 29	Dec. 5	Dec. 10
Brockport	Monroe	538	57	Apr. 9	May 27	Sept. 14	Nov. 7	Mar. 11	Mar. 24	Apr. 7	Apr. 21	May 7	Oct. 20	Nov. 3	Nov. 11	Nov. 21	Nov. 30
Buffalo	Erie	693	66	Apr. 8	May 23	Oct. 3	Nov. 15	Mar. 15	Mar. 23	Apr. 3	Apr. 20	Apr. 30	Oct. 25	Nov. 9	Nov. 20	Nov. 29	Dec. 6
Cairo	Greene	340	32	Apr. 12	May 31	Sept. 21	Oct. 25	Mar. 16	Mar. 31	Apr. 11	Apr. 22	May 10	Oct. 4	Oct. 15	Oct. 29	Nov. 14	Nov. 29
Canton	St. Lawrence	406	63	Apr. 13	June 2	Sept. 11	Oct. 20	Mar. 26	Apr. 3	Apr. 15	Apr. 28	May 9	Sept. 26	Oct. 10	Oct. 24	Nov. 8	Nov. 19
Carmel	Putnam	500	61	Mar. 31	May 26	Sept. 14	Nov. 7	Mar. 16	Mar. 24	Apr. 9	Apr. 22	May 3	Oct. 10	Oct. 22	Nov. 4	Nov. 18	Nov. 30
Chasm Falls	Franklin	1030	24	May 3	June 30	Aug. 25	Oct. 3	Mar. 31	Apr. 16	Apr. 30	May 10	May 25	Sept. 14	Oct. 2	Oct. 11	Oct. 27	Nov. 14
Chazy	Clinton	120	52	Apr. 19	June 20	Sept. 8	Oct. 22	Mar. 24	Apr. 6	Apr. 17	Apr. 30	May 15	Sept. 26	Oct. 8	Oct. 27	Nov. 8	Nov. 22
Cooperstown	Otsego	1240	67	Apr. 17	June 23	Aug. 25	Oct. 25	Apr. 1	Apr. 11	Apr. 26	May 12	May 22	Sept. 22	Oct. 5	Oct. 18	Nov. 3	Nov. 16
Cortland	Cortland	1129	64	Apr. 15	June 20	Aug. 25	Nov. 5	Mar. 20	Mar. 29	Apr. 13	Apr. 26	May 13	Sept. 30	Oct. 19	Nov. 7	Nov. 21	Nov. 28
Dannemora	Clinton	1338	51	Apr. 19	June 4	Sept. 10	Oct. 25	Apr. 4	Apr. 11	Apr. 23	May 1	May 13	Oct. 2	Oct. 12	Oct. 26	Nov. 7	Nov. 12
Dansville	Livingston	700	34	Apr. 11	May 25	Sept. 19	Nov. 1	Mar. 16	Mar. 29	Apr. 13	Apr. 24	May 10	Oct. 7	Oct. 27	Nov. 11	Nov. 25	Nov. 29
Delhi	Delaware	1460	33	May 11	June 22	Aug. 25	Oct. 12	Mar. 29	Apr. 17	Apr. 30	May 15	May 29	Sept. 23	Oct. 4	Oct. 19	Oct. 30	Nov. 14
Elmira	Chemung	863	62	Apr. 5	June 10	Sept. 10	Nov. 16	Mar. 13	Mar. 22	Apr. 8	Apr. 19	May 6	Oct. 9	Oct. 25	Nov. 6	Nov. 24	Dec. 3
Franklinville	Cattaraugus	1590	35	Apr. 28	June 18	Aug. 24	Oct. 20	Apr. 5	Apr. 17	May 6	May 18	May 31	Sept. 13	Sept. 29	Oct. 14	Oct. 31	Nov. 11
Fredonia	Chautauqua	750	42	Apr. 8	May 28	Sept. 26	Nov. 15	Mar. 14	Mar. 24	Apr. 5	Apr. 20	May 7	Oct. 24	Nov. 4	Nov. 21	Dec. 1	Dec. 6
Geneva	Ontario	615	49	Apr. 17	May 28	Sept. 11	Nov. 12	Mar. 13	Mar. 26	Apr. 8	Apr. 20	May 6	Oct. 11	Oct. 27	Nov. 12	Nov. 25	Dec. 3
Glenham	Dutchess	227	25	Apr. 6	May 25	Sept. 24	Oct. 31	Mar. 14	Mar. 22	Mar. 30	Apr. 18	Apr. 29	Oct. 7	Oct. 24	Nov. 5	Nov. 21	Dec. 1
Gloversville	Fulton	770	65	Apr. 12	June 4	Sept. 10	Oct. 22	Mar. 27	Apr. 8	Apr. 18	Apr. 30	May 14	Sept. 30	Oct. 10	Oct. 26	Nov. 6	Nov. 19
Gouverneur	St. Lawrence	450	20	Apr. 22	June 6	Sept. 8	Oct. 3	Mar. 31	Apr. 9	Apr. 23	May 5	May 19	Sept. 18	Sept. 26	Oct. 10	Oct. 26	Nov. 13
Greenfield Center	Saratoga	610	58	Apr. 13	June 9	Aug. 25	Oct. 25	Mar. 24	Apr. 1	Apr. 15	Apr. 27	May 10	Sept. 29	Oct. 14	Oct. 26	Nov. 10	Nov. 21
Hemlock	Livingston	920	59	Apr. 13	June 1	Sept. 19	Nov. 11	Mar. 20	Mar. 31	Apr. 11	Apr. 25	May 8	Oct. 12	Oct. 26	Nov. 8	Nov. 22	Nov. 30
Indian Lake	Hamilton	1660	57	May 16	July 25	Aug. 8	Sept. 29	Apr. 15	Apr. 30	May 14	May 27	June 11	Aug. 27	Sept. 20	Oct. 4	Oct. 16	Oct. 26
Ithaca	Tompkins	928	78	Apr. 9	June 9	Sept. 11	Nov. 1	Mar. 18	Mar. 29	Apr. 12	Apr. 23	May 12	Oct. 4	Oct. 21	Nov. 5	Nov. 21	Nov. 29
Jamestown	Chautauqua	1390	50	Apr. 8	June 20	Sept. 15	Nov. 1	Mar. 17	Mar. 31	Apr. 10	Apr. 25	May 16	Oct. 7	Oct. 23	Nov. 11	Nov. 23	Dec. 4
Lake Placid Club	Essex	1864	48	May 15	July 20	Aug. 18	Oct. 9	Apr. 12	Apr. 22	May 3	May 18	June 4	Sept. 11	Sept. 22	Oct. 9	Oct. 21	Nov. 2
Lawrenceville	St. Lawrence	480	26	Apr. 13	May 29	Sept. 12	Oct. 19	Mar. 31	Apr. 13	Apr. 26	May 9	May 14	Sept. 22	Oct. 9	Oct. 17	Nov. 1	Nov. 14
Letchworth Park	Wyoming	1260	40	Apr. 17	June 13	Sept. 10	Nov. 1	Mar. 25	Apr. 3	Apr. 19	May 1	May 18	Oct. 6	Oct. 17	Oct. 31	Nov. 18	Nov. 27
Lewiston	Niagara	323	22	Apr. 8	May 25	Sept. 23	Nov. 1	Mar. 15	Mar. 26	Apr. 5	Apr. 14	May 7	Oct. 11	Oct. 29	Nov. 17	Nov. 25	Dec. 7

Station	County	Elevation	Length Record	Last 32°F. Temperature in Spring		First 32°F. Temperature in Fall		Mean Date Last Spring Minimum					Mean Date First Fall Minimum				
				Earliest	Latest	Earliest	Latest	16°F.	20°F.	24°F.	28°F.	32°F.	32°F.	28°F.	24°F.	20°F.	16°F.
Lockport	Niagara	520	65	Apr. 9	May 28	Sept. 19	Nov. 10	Mar. 19	Mar. 28	Apr. 10	Apr. 23	May 9	Oct. 13	Oct. 31	Nov. 14	Nov. 23	Dec. 3
Lowville	Lewis	860	66	Apr. 27	June 22	Aug. 25	Oct. 22	Mar. 29	Apr. 8	Apr. 22	May 5	May 18	Sept. 21	Oct. 4	Oct. 20	Nov. 3	Nov. 13
McKeever	Herkimer	1530	18	May 15	June 22	Aug. 14	Sept. 26	Apr. 9	Apr. 21	May 9	May 17	June 5	Sept. 9	Sept. 25	Oct. 10	Oct. 23	Nov. 4
Millbrook	Dutchess	796	14	Apr. 30	May 30	Sept. 10	Oct. 18	Mar. 25	Apr. 1	Apr. 16	Apr. 29	May 14	Sept. 29	Oct. 6	Oct. 24	Nov. 5	Nov. 21
Mineola	Nassau	128	19	Mar. 11	Apr. 24	Oct. 19	Dec. 13	Mar. 5	Mar. 9	Mar. 15	Mar. 26	Apr. 7	Nov. 16	Nov. 29	Dec. 6	Dec. 13	Dec. 16
Mohonk Lake	Ulster	1245	61	Apr. 3	May 19	Sept. 19	Nov. 15	Mar. 17	Mar. 25	Apr. 5	Apr. 16	Apr. 29	Oct. 22	Nov. 4	Nov. 16	Nov. 23	Dec. 1
Morrisville	Madison	1325	46	Apr. 29	June 20	Aug. 25	Oct. 16	Mar. 30	Apr. 12	Apr. 26	May 10	May 21	Sept. 20	Oct. 3	Oct. 19	Oct. 30	Nov. 14
Newcomb	Essex	1700	16	May 5	June 22	Sept. 8	Oct. 7	Apr. 4	Apr. 17	Apr. 29	May 12	May 27	Sept. 16	Sept. 27	Oct. 10	Oct. 29	Nov. 9
New York City	New York	10	85	Mar. 11	Apr. 30	Oct. 15	Dec. 10	Mar. 3	Mar. 10	Mar. 15	Mar. 24	Apr. 7	Nov. 12	Nov. 24	Dec. 2	Dec. 7	Dec. 13
Norwich	Chenango	1070	49	Apr. 21	June 22	Aug. 24	Oct. 26	Mar. 26	Apr. 10	Apr. 24	May 7	May 19	Sept. 24	Oct. 6	Oct. 22	Oct. 30	Nov. 18
Ogdensburg	St. Lawrence	258	66	Apr. 9	May 30	Sept. 10	Oct. 26	Mar. 25	Mar. 31	Apr. 13	Apr. 25	May 8	Oct. 8	Oct. 24	Nov. 2	Nov. 15	Nov. 26
Oneonta	Otsego	1112	63	Apr. 14	June 20	Aug. 25	Oct. 22	Mar. 25	Apr. 1	Apr. 20	May 1	May 19	Sept. 28	Oct. 11	Oct. 25	Nov. 9	Nov. 21
Oswego	Oswego	292	86	Mar. 26	May 29	Sept. 28	Nov. 18	Mar. 13	Mar. 19	Mar. 28	Apr. 10	Apr. 24	Oct. 24	Nov. 9	Nov. 20	Nov. 28	Dec. 4
Patchogue	Suffolk	25	20	Apr. 9	May 14	Oct. 4	Nov. 9	Mar. 10	Mar. 22	Mar. 31	Apr. 11	Apr. 28	Oct. 12	Oct. 27	Nov. 15	Nov. 24	Dec. 8
Penn Yan	Yates	765	46	Apr. 9	June 6	Sept. 11	Nov. 18	Mar. 19	Mar. 30	Apr. 12	Apr. 25	May 13	Oct. 5	Oct. 18	Nov. 3	Nov. 15	Nov. 28
Peru	Clinton	507	19	Apr. 27	June 4	Sept. 10	Oct. 7			Apr. 21	May 4	May 15	Sept. 22	Oct. 3	Oct. 13		
Port Jervis	Orange	470	67	Apr. 9	May 28	Sept. 11	Nov. 11	Mar. 16	Mar. 26	Apr. 9	Apr. 24	May 10	Oct. 4	Oct. 17	Oct. 28	Nov. 10	Nov. 27
Riverhead	Suffolk	100	19	Mar. 14	May 2	Oct. 16	Dec. 1	Mar. 2	Mar. 10	Mar. 16	Apr. 2	Apr. 15	Nov. 8	Nov. 22	Dec. 5	Dec. 10	Dec. 16
Rochester	Monroe	543	65	Apr. 8	May 29	Sept. 27	Nov. 23	Mar. 12	Mar. 20	Mar. 31	Apr. 16	Apr. 28	Oct. 21	Nov. 5	Nov. 19	Nov. 28	Dec. 4
Roxbury	Delaware	1490	40	Apr. 23	June 22	Aug. 25	Oct. 13	Apr. 4	Apr. 20	Apr. 28	May 12	May 28	Sept. 18	Sept. 30	Oct. 10	Oct. 26	Nov. 4
Salem	Washington	490	14	May 4	June 9	Sept. 8	Oct. 4	Mar. 30	Apr. 8	Apr. 25	May 8	May 25	Sept. 19	Sept. 30	Oct. 7	Oct. 24	Nov. 8
Salisbury	Herkimer	1300	60	May 1	June 22	Aug. 11	Oct. 26	Apr. 5	Apr. 15	Apr. 25	May 12	May 29	Sept. 18	Sept. 29	Oct. 13	Oct. 31	Nov. 8
Scarsdale	Westchester	199	53	Mar. 27	May 25	Sept. 22	Nov. 11	Mar. 10	Mar. 15	Mar. 26	Apr. 10	Apr. 21	Oct. 20	Oct. 30	Nov. 20	Nov. 30	Dec. 6
Schroon Lake	Essex	880	10	May 19	June 19	Aug. 22	Sept. 26			May 3	May 22	June 4	Sept. 9	Sept. 21	Oct. 2	Oct. 16	Nov. 11
Setauket	Suffolk	40	68	Mar. 12	May 17	Oct. 19	Nov. 30	Mar. 2	Mar. 9	Mar. 15	Mar. 26	Apr. 10	Nov. 9	Nov. 23	Dec. 4	Dec. 8	Dec. 15
Sharon Springs 1N	Schoharie	821	41	Apr. 19	June 9	Sept. 11	Nov. 11	Mar. 22	Apr. 2	Apr. 15	Apr. 29	May 10	Oct. 1	Oct. 15	Oct. 27	Nov. 8	Nov. 22
Sodus	Wayne	428	27	Apr. 9	May 29	Sept. 20	Oct. 31	Mar. 21	Mar. 28	Apr. 12	Apr. 22	May 6	Oct. 9	Oct. 27	Nov. 5	Nov. 22	Nov. 29
South Wales	Erie	1073	25	Apr. 20	June 8	Sept. 12	Oct. 22	Mar. 25	Apr. 3	Apr. 16	May 5	May 17	Oct. 1	Oct. 14	Nov. 2	Nov. 15	Nov. 24
Spencertown	Columbia	634	15	May 2	June 8	Sept. 8	Oct. 6	Mar. 31	Apr. 10	Apr. 29	May 14	May 22	Sept. 21	Sept. 28	Oct. 9	Oct. 31	Nov. 12
Spier Falls	Saratoga	380	55	Apr. 16	June 8	Sept. 8	Oct. 6	Mar. 20	Mar. 29	Apr. 12	Apr. 21	May 10	Oct. 7	Oct. 20	Nov. 4	Nov. 16	Nov. 26
Stafford	Genesee	925	25	Apr. 17	May 27	Sept. 8	Oct. 22	Mar. 21	Mar. 28	Apr. 9	Apr. 27	May 13	Oct. 4	Oct. 16	Nov. 7	Nov. 18	Nov. 27
Stillwater Reservoir	Herkimer	1670	30	May 11	June 19	Aug. 25	Oct. 9	Apr. 12	Apr. 22	May 5	May 15	May 28	Sept. 19	Sept. 28	Oct. 11	Oct. 27	Nov. 7
Syracuse	Onondaga	399	55	Apr. 9	May 20	Sept. 13	Nov. 12	Mar. 14	Mar. 21	Apr. 4	Apr. 15	Apr 30	Oct. 15	Oct. 29	Nov. 14	Nov. 23	Dec. 2
Tupper Lake	Franklin	1700	37	May 9	June 23	Aug. 25	Oct. 9	Apr. 8	Apr. 17	Apr. 26	May 14	May 28	Sept. 16	Sept. 28	Oct. 10	Oct. 28	Nov. 10
Utica—Southern Reservoir	Oneida	607	10	Apr. 9	May 25	Sept. 25	Oct. 25	Mar. 20	Mar. 28	Apr. 12	Apr. 30	May 14	Oct. 2	Oct. 19	Nov. 1	Nov. 13	Nov. 27
Wanakena	St. Lawrence	1510	47	May 5	June 22	Aug. 21	Oct. 9	Apr. 11	Apr. 22	May 2	May 14	June 2	Sept. 13	Sept. 28	Oct. 7	Oct. 22	Nov. 5
Wappingers Falls	Dutchess	1610	64	Apr. 8	May 31	Sept. 11	Nov. 11	Mar. 17	Mar. 30	Apr. 16	Apr. 27	May 12	Sept. 29	Oct. 10	Oct. 22	Nov. 3	Nov. 24
Watertown	Jefferson	497	63	Apr. 13	June 1	Sept. 11	Nov. 1	Mar. 23	Mar. 31	Apr. 13	Apr. 26	May 7	Oct. 4	Oct. 18	Oct. 28	Nov. 13	Nov. 24
West Point	Orange	386	59	Mar. 31	May 14	Sept. 26	Nov. 24	Mar. 9	Mar. 14	Mar. 21	Apr. 3	Apr. 18	Oct. 26	Nov. 8	Nov. 25	Dec. 3	Dec. 8
Whitehall	Washington	119	14	Apr. 7	June 9	Sept. 23	Oct. 20	Mar. 23	Mar. 29	Apr. 5	Apr. 14	May 10	Oct. 1	Oct. 15	Oct. 31	Nov. 13	Nov. 28

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